REMARKS/ARGUMENTS

Amendments to the Claims/Election

The Office Action rejected the Applicant's traversal of a requirement to elect between Claims 21 to 25 and 27 to 32. However, the Office Action indicated that Claims 27 to 32 may be rejoined to Claims 21 to 25 after a determination of the allowability of Claims 21 to 25. The listing of Claims has been modified to indicate that Claims 27 to 32 are currently withdrawn. However, the Applicant requests that Claims 27 to 32 be allowed if any of Claims 21 through 25 are allowed with appropriate amendment to part (a) of Claim 27 if less than all of Claims 21 to 25 are allowed.

Claim 22 is amended to correct a mis-spelling of the word "wherein".

Claim Rejections – 35 U.S.C. 103

The Office Action rejects Claims 21 to 25 as being obvious over the Zha '200 in view of Cote '424 and Miyashita '602.

The Office Action acknowledges that the primary reference, Zha '200, fails to teach the relationship between membrane surface area and horizontal cross-sectional area of a tank described in part (g) of Claim 21. Zha '200 does mention, in one instance, a trial module having 11,000 fibers, but the length of the fibers is not stated and so the membrane surface area of that module cannot be calculated. Further, the cross-sectional area of an appropriate tank for that trial module is not specified or even raised as an issue to be considered. Accordingly, the Applicants submit that Zha '200 not only fails to disclose the restriction of part (g) of Claim 21 but also fails to suggest a combination of the examples in Zha '200 with any other citation related to part (g) of Claim 21.

The Applicants further submit that Zha '200 does not motivate the combination of (d) of Claim 21 with other references. Each cited reference must be considered in its entirety

(MPEP 2141.02, 6th Section). Zha '200 suggests a retentate outlet located above the modules at only one instance (Column 2, lines 46 to 48) as part of a single sentence describing alternate methods of removing accumulated solids from the tank. The preferred method of removing solids from the tank in Zha '200 is to periodically drain the tank which requires (as shown in Figure 5), a retentate outlet below the modules rather than above the modules. Removing the solids by draining the tank is the only method of removing solids from the tank shown in any figure in Zha '200 or described in any part of the modes for carrying out the invention in Zha '200. Accordingly, Zha '200 teaches a strong preference for locating the retentate outlet below the modules rather than above them. Since the claims are rejected under 35 U.S.C. 103, the burden is on the Office to provide prima facie evidence why a person skilled in the art seeking to combine the disclosures in Zha '200 with one or both of Cote '424 and Miyashita '602 would choose to combine those references in a way that produces a reactor as in the Applicants' current Claim 21. A mere mention of the possibility of the outlet being above the modules in Zha '200 is not sufficient evidence. This mere mention does not provide any suggestion or motivation to put the retentate outlet above the modules in a reactor having all of the elements of Claim 21, particularly since Zha '200 as a whole favours a different location for the retentate outlet.

The Office Action relies on Cote '424 for motivating a person skilled in the art to produce a reactor with the membrane surface area per square meter of horizontal cross-sectional area of tank specified in part (g) of Claim 21. No part of Cote '424 explicitly discloses part (g) of Claim 21 or any other specific value or range of membrane surface area per square meter of tank area. Instead, the Office Action notes various ranges of other perimeters in Cote '424 and states that several ranges having at least 500 square meters for every square meter of horizontal cross-sectional area can result. The mere possibility that a device within part (g) of Claim 21 might result from selecting a set of perimeters from within the ranges in Cote '424 does not provide prima facie evidence that a person skilled in the art is being taught to make those selections. Selections could also be made that do not result in a reactor that satisfies part (g) of Claim 21.

Further, Cote '424 provides no teaching that at the ratio of module surface area to horizontal cross-sectional area of the tank is of any concern. For example, there is no mention of the cross-sectional area of any of the many tanks discussed in Cote '424. Accordingly, the Applicants submit that Cote '424 does not disclose element (g) of Claim 21. Further, Cote '424 does not provide any motivation for a combination with the other cited references to produce a reactor of Claim 21.

The following paragraphs will consider statements made regarding Cote '424 in the Office Action in detail.

a) The Office Action states that Cote '424 teaches suitable ranges of membrane surface areas per volume of substrate contained in the tank. The Applicants submit that Cote '424 does not teach any particular range of membrane surface area per volume of substrate in the tank. The only reference which the Applicants can locate in Cote '424 that links the surface area of the membranes to a volume of substrate is at Column 8, lines 52 to 55. In that reference, however, it is said that the fibers should be packed in the header to maximize the membrane area per unit volume of substrate without adversely affecting the circulation of substrate through the skein. Accordingly, the Applicants submit, that reference relates the surface area of membrane modules per volume of substrate displaced by the module, not the volume of substrate in the tank, and cautions that this ratio is limited by the need to not adversely affect circulation of substrate through the skein. No particular ratio is mentioned. The cross-sectional area of the tank is also not mentioned.

b) The Office Action states that performance as based on a sum of surface area of a skein is discussed in Cote '424 at Column 6, lines 4 to 11 and in the last paragraph of Column 6 bridging the first paragraph of Column 7. These passages are part of a discussion of how the configuration of modules in Cote '424 negates feed channeling, such that substantially all of the surface area of the skein may be effective. Accordingly, the cited passage concludes that the

filtration performance of the module may be based on a sum of the performance of all fibers because none of the fibers will be lost to permeation due to feed channeling. The cited reference is a comment on the module configuration and does not suggest any concern for maximizing the area of membrane modules in relation to the cross-sectional area of the tank.

c) The Office Action states that Cote '424 describes modules having up to 1000 m^2 of membrane surface area and reservoir having a volume "in excess to" 100 – 1000 liters (Column 10, lines 34 to 37 and 60, 68, Column 11, lines 1 to 7). The complete text states that the area of a module may range between 1 and 1000 m^2 and that the volume of a tank should be in excess of 100 liters and generally in excess of 1000 liters. There is no maximum volume of the tank given. There is also no teaching of any selection or combination of membrane surface areas and tank volumes. The ranges of membrane surface area and reservoir volume are simply stated as distinct and independent perimeters. Only examples 1 and 2 of Cote '424 describe a selection of a membrane surface area and a tank volume. Both examples described modules of only about 1 m^2 located in tanks of about 100 liters suggesting that very small tanks should similarly have a very small membrane surface area. Surface area of the tank is again not given.

d) The Office Action suggests that a person skilled in the art would be motivated to select the cross-sectional area of a tank based on membrane length. Membrane length alone does not suggest any particular cross-sectional area of a tank for two reasons. Firstly, Cote '424 suggests a strong preference for modules with a looped or parabolic configuration. In these configurations, the length of the fibers is unrelated to the width of the modules. Secondly, even in an embodiment where the fibers are near horizontal, as shown in some of Figures 9 or 10 in Cote ' 424, the length of the fibers has no relationship to the dimension of the tank in the direction perpendicular to the fibers of a rectangular tank. Accordingly, the length of the fibers cannot determine cross-sectional area of a tank. In a circular tank, a module having fibers stretched horizontally with the headers near the tank wall could only be provided in a center portion of the tank. This would severely

limit the amount of membrane surface area that could be provided in a unit of cross-sectional area of the tank. Again, there is no clear teaching in Cote '424 to any particular cross-sectional area of a tank.

The Applicants further submit that the suggestions in the Office Action do not consider Cote '424 as a whole. For example, Column 11, lines 48 to 51 state that it is an object of the invention of Cote '424 to provide an assembly which separates a desired permeate from a large body of substrate. Column 11, lines 1 to 2 refer to a reservoir of arbitrary proportions. Column 12, lines 41 to 42 describe, as part of the general objects of the invention, providing an arbitrarily large body of substrate. Column 17, line 67 refers to a substrate confined in a large tank or pond (emphasis added). Considering these citations, and the reference as a whole, the Applicants submit that Cote '424 does not teach any particular relationship between the surface area of modules and the horizontal cross-sectional area of the tank and certainly not a ratio as high as that provided in the present Claim 21.

The Applicants further submit that the Office Action does not provide any teaching in Cote '424 towards its combination with Zha '200 in a way that would result in a combination of elements provided in Claim 21. In particular, there is no suggestion that a reactor having the module surface area specified in part (g) of Claim 21 should be fitted with a retentate outlet located above the modules. In contrast, Cote '424 shows only one embodiment, Figure 6, having an outlet of any kind located above the modules. This outlet, element 85, is used to recirculate feed water to an aeration basin upstream of the tank holding the membranes. The module shown in the Figure 5 occupies only a small part of the cross-sectional area of the tank suggesting away from a combination of large membrane surface area per unit of horizontal cross-sectional area of a tank with an outlet of any kind above the modules.

Regarding reference Miyashita '602, the Office Action notes that this reference discloses a packing density of 500 m^2 per cubic meter for a minimum volume

surrounding the membranes. The ratio cited is a ratio of membrane surface area to volume of a notional rectangular solid of minimal volume surrounding a set of membrane elements connected together to form a larger unit. The volume of the tank that such a collection of membranes would be installed in is not specified or suggested. This is explained at Column 6, lines 29 to 44. As also stated in this section, the membrane density of 500 m^2 per meter is an upper limit. The membrane surface area is more preferably kept below 400 m^2 per meter cubed in consideration of the resistance of the membranes to the passage of air bubbles and a gas/liquid mix during washing. Accordingly, reference Miyashita '602 expresses a caution against increasing the ratio of surface area to membrane unit volume too high. No ratio of membrane surface area to tank cross-sectional area is discussed. There is also no teaching to motivate a person skilled in the art to combine any disclosure in reference Miyashita '602 with either of the other cited references to produce the combination of Claim 21. In particular, there is no suggestion in Miyashita '602 that any particular membrane assembly should be used in a reactor having a retentate outlet above the modules.

In summary, the Office Action does not provide any references that explicitly disclose part (g) of Claim 21 or even an embodiment within the range of part (g). The Applicants further submit that none of the cited references teach towards element (g) of Claim 21. The cited references also provide no motivation towards their combination to produce a reactor having all of the limitations of Claim 21, particularly parts (d) and (g).

The Applicants further submit that dependent Claims 22 to 25 describe patentable subject matter and should be indicated as allowable. Claim 22 states that the modules cover more than 90% of the horizontal cross-sectional area of the tank. None of the cited references teach this limitation. Further, none of the cited references teach towards a combination of this limitation with a reactor having modules with a surface area of at least 500 square meters for every horizontal cross-sectional area of the tank and a retentate outlet located above the modules.

Claim 23 describes a structure having, among other things, elements, each element having a pair of opposed headers, separated from each other by impervious plates. This claim limitation is not taught or suggested in any of the cited references. In a previous paper, the Office noted that Miyashita '602 describes a casing around an assembly of elements. However, the casing in Miyashita '602 surrounds several elements and does not include impervious plates separating the elements from each other as required in Claim 23. Accordingly, Miyashita '602 fails to disclose the added elements of Claim 23. Further, the Office Action does not provide any evidence that Miyashita '602 teaches or suggests including impervious plates between the individual elements, particularly in combination with a reactor having all of the limitations of Claim 21 and Claim 23. Accordingly, the Applicants submit that a prima facie case of obviousness of Claim 23 has not been established, since all claim limitations are not taught or suggested (MPEP 2143.03). Claim 24 depends on Claim 23 and is not obvious, at least for the same reasons.

Claim 25 depends on Claim 21. The Office Action does not provide a prima facie case showing that the cited references teach the combination of the elements of Claim 25 with the elements in the claims that they depend on. Since the claimed invention, as a whole, must be considered (MPEP 2141.02, first section) the Applicants submit that a prima facie case of obviousness has not been established.

For the reasons given above, the Applicants submit that the Claims are allowable.

Respectfully submitted,

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